Biological Evaluation of

Emerald Ash Borer

at

US Fish and Wildlife, National Conservation Training Center

Shepherdstown, West Virginia

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ABSTRACT

During the fall of 2012, US Forest Service, Morgantown Field Office (MFO) and the US Fish and Wildlife Service (FWS), National Conservation Training Center (NCTC) staff conducted a survey for the emerald ash borer (EAB) and an intensive ash (*Fraxinus* spp.) inventory at the NCTC. The purpose of this project was to 1) assess the location, health, and extent of ash within the NCTC, 2) determine the need for ash treatments especially where trees could become hazards in high use areas and in habitats with ecological value, and 3) establish an EAB monitoring program. Field surveys evaluated 388 ash trees in the campus zone, of which 235 were determined to be of sufficient value, or would pose a significant hazard if killed, to warrant preventative treatment. Due to time and personnel limitations trees in the portion of the property outside the campus zone have not yet been inventoried and are not expected to be included in the 2013 EAB preventative treatment program, though other aspects of EAB monitoring and management might apply, including inventory and evaluation for possible treatment of certain trees in 2014. No signs or symptom consistent with EAB (e.g. epicormic branching, woodpecker activity, bark splitting, or boring insects) were noted. Since EAB has been found in the Antietam National Battlefield, which is 3 miles east of the NCTC, it is recommended that a comprehensive ash management plan be developed and a chemical prevention treatment plan be put into place to protect these high value specimen trees.

BACKGROUND

The Emerald Ash Borer (*Agrilus planipennis*) is an invasive species that has killed millions of ash trees in North America. EAB affects all species and diameter classes of ash and often kills both healthy and stressed trees within three to five years after coming infested (1). EAB has the potential to effectively eliminate entire tree species from our forests. It could potentially eliminate all of the species in an entire genus (2).

Not only does EAB cause severe economic damage, there are ecological consequences associated with the loss of ash from North American forests. Studies show that ash provides food and habitat for several bird and mammal species (3 & 4). Forty-three native arthropod species are at high risk due to their association with ash for breeding or feeding (5). In addition, ash contributes to nutrient cycling in hardwood forests (6).

Based on data from the USDA Animal and Plant Health Inspection Service (APHIS), EAB emerge around mid-June and are present through mid-August (7). Adult beetles are slender, elongate, and bright green and feed on ash foliage in patches along the leaf margins (8). Adult beetles usually live for about three weeks and females lay about 50-100 eggs (9). Eggs hatch in 7-10 days and larvae chew through the bark and feed on phloem and outer sapwood for several weeks, creating S-shaped galleries packed with frass (10). Larvae are white to cream-colored,

10-segmented, and flattened. Larvae overwinter in shallow chambers in the outer sapwood or bark on thick barked trees (10). EAB pupate in late April or May and adults emerge 1-2 weeks after pupation through D-shaped exit holes (9).

EAB was first found in the Detroit, Michigan/Windsor, Ontario area in 2002 (9). To date, EAB had been detected in 14 other states including: Illinois, Indiana, Iowa, Kentucky, Maryland, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin as well as Canadian provinces of Ontario and Quebec (2).

EAB was first discovered in Fayette County West Virginia in 2007 (11). Personnel from the USDA Forest Service (USFS) and APHIS tried to contain the pest within a one-half mile buffer of the original infestation. However, by 2009, USFS discovered additional infestation sites outside the buffer zone. To date, 24 counties in West Virginia are infested with EAB (see map A-1, Appendix A). Even though EAB has not been detected in Jefferson County, it was first detected in 2012 at Antietam National Battlefield near Sharpsburg, MD. (Pannill, personal communication) This battlefield is located 3 air miles east of the NCTC. The ability of EAB to fly several miles was the catalyst that launched the NCTC land managers to be proactive in protecting the two native ash species located on the 532 acre site.

PURPOSE AND NEED

The MFO received a request from Phil Pannill, land manager for NCTC, to assist their staff in preparing a biological evaluation. This project was undertaken by the MFO to address this request and evaluate what management options are available to protect and maintain the ash resources at the NCTC. The NCTC currently has 2 species of native ash, white ash (*Fraxinus americana*) and, less commonly, green ash (*Fraxinus pennsylvanica*).

PROJECT LOCATION/DESCRIPTION

NCTC is located in Jefferson County approximately three miles north of Shepherdstown, West Virginia, along the Potomac River, which forms its northern boundary. Terrapin Neck Road forms the eastern boundary of the property, with Shepherd Grade Road forming the southwest border. The NCTC covers approximately 532 acres of which 284 acres are forested (see map A-2, Appendix A). The primary purpose of NCTC is to enhance conservation of fish, wildlife, and their habitats through leadership in conservation education for the public; training for the conservation and resource management community; and fostering alliances among diverse interests.

In keeping with their mission, an environmental assessment (EA) was prepared in 2011 by the FWS for the NCTC regarding management strategies to control invasive plant species, promote the growth of native plants, control other pests, and prepare for a potential wildfire. The FWS

proposed various treatment methods (such as manual, mechanical, biological, cultural, chemical, and prescribed fire) to achieve management objectives. The prevention and suppression of EAB would be covered under the "control of other pests" as stated in the EA.

PROJECT OBJECTIVES

The objectives for this evaluation were to 1) assess the location, health, and extent of ash within the NCTC, 2) determine the need for ash treatments especially where trees could become hazards in high use areas and in habitats with ecological value, and 3) establish an EAB monitoring program.

PROJECT METHODS

During the initial site visit on October 18, 2012, the MFO and NCTC staff did a preliminary survey of ash species on the campus of NCTC. No signs of EAB were noticed on any of the ash trees surveyed. NCTC land managers continued a more intensive survey using these procedures:

1. Stand Number (Using maps from the Land Management Plan)
2. Tree Number (sequential number)
3. Geospatial Location (GPS)
4. Species - White or Green Ash
5. DBH
6. Location Rating 1=poor, 2=fair, 3=good, 4=excellent. Factors include: Visibility and prominence, such as in front of a building, beside a well-used walkway, beside a patio, visible from more than two or more sides, etc. Is it in a suitable spot for long term survival and management, close to a road or structure that will require that it be removed, pruned or cabled? Is it in or near (<25') a wetland or waterway that might preclude pesticide treatment?
7. Condition Rating 1=poor, 2=fair, 3=good, 4=excellent. Factors include: How healthy, vigorous, and defect-free is the tree, crown size, shape and position, branch structure, presence of many fine branches, lack of exit holes, woodpecker activity or other signs of EAB. How likely is it that if protected from EAB, that the tree will survive and thrive for the next 30+ years?
8. Hazard/Target Rating 0=none, 1=minor, 2=major. What if any, could the tree fall on if it died, or, how urgent would the need be to remove the tree if it did die. Major targets would be buildings, parking lots, paved roads, other significant structures or areas where people congregate. Minor targets would be less frequented paths, hiking trails, gravel roads, etc.

Estimating the relative value of trees in an urban/residential/landscape setting using the criteria of tree size, location and condition is well established in the field of arboriculture.

RESULTS

Field surveys identified, mapped, measured and evaluated 388 ash trees in the campus zone. Of these 235 were determined to be of sufficient value to warrant preventative treatment. (Appendix B). High value trees in the Campus Zone are those trees of aesthetic value, provide favorable microclimate conditions and other ecological services, or if killed could be a potential hazard to people and facilities.

All tree locations were recorded by GPS and mapped in ArcGIS. Each of the 388 trees was evaluated and a decision for treatment was made based on the rating information described in Project Methods, above.

No signs or symptoms consistent with the EAB (e.g. epicormic branching, woodpecker activity, bark splitting, or boring insects) were noted in any of the ash trees surveyed.

DISCUSSION

Based on the survey results, ash trees are healthy and EAB has not yet arrived. Even though EAB has not been detected on site does not mean they are not present. A newly infested tree does not display many symptoms of attack in the first year of colonization; therefore a monitoring program should be implemented.

When EAB arrives, the NCTC will be forced to respond to its arrival to some degree, regardless of the strategy they adopt. Dead trees within the main campus zone of the NCTC will present a threat to public safety and must be removed. The loss of ash from the Conservation Zone will hinder the NCTC in achieving the goal of protecting resources, restoring and enhancing ecosystems, and providing conditions that support biological diversity as stated in the 2011 EA.

Management Considerations

Chemical management options for protecting ash stands are limited by the biology and feeding behavior of EAB, population densities, site conditions (i.e. proximity to streams), accessibility, and limited application technology currently available. Insecticide treatments although effective, are conducted on an individual tree basis which can be labor intensive and costly. Therefore, treatment strategies are typically focused in high value sites such as recreational or scenic areas, or where ash stands have an important ecological role.

Chemical Control : Chemical control options for EAB were reviewed by Herms et.al (13) and include: (1) systemic insecticides that are applied as soil injections or drenches; (2) systemic

insecticides applied as trunk injections; (3) systemic insecticides applied as lower trunk sprays; and (4) protective cover sprays that are applied to the trunk, main branches, and (depending on the label) foliage.

The most widely tested and effective soil applied systemic insecticide for control of EAB is imidacloprid. Dinotefurn was recently labeled for use against EAB and studies to test its effectiveness are currently underway in Michigan and Ohio.

Several systemic insecticide products can be injected directly into the trunk of the tree including formulations of imidacloprid and ememectin benzoate. Ememectin benzoate is the only treatment that studies have shown to provide up to two years of protection from EAB (2). The advantage of trunk injections is that they can be used on sites where trees are growing in excessively wet, compacted, or restricted soil environments. However, trunk injections can cause long term damage, especially if treatments are applied annually.

Studies to date indicate that systemic basal trunk sprays with either dinotefuron and imidacloprid for the control of EAB has shown variable results in research trials. Control was better in smaller trees than large trees. Studies to address the long-term effectiveness of annual dinotefuran application for control of EAB are underway (13).

Protective cover sprays have been shown effective for controlling EAB adults as they feed on leaves in the canopy. It should be noted that spraying large trees is likely to result in a considerable amount of insecticide drift. Drift and potential effects of insecticides on non-target organisms should be considered.

RECOMMENDATIONS

Treatment: Currently the only available option for protecting trees is limited to individual tree chemical treatments. The basic guidelines used to decide when to treat for EAB is when areas are within a quarantined county or within 10-15 miles of a known EAB infestation (13). The NCTC meets both of these parameters since the entire state of WV is quarantined and the nearest known EAB infestation is within 3 miles. It is recommended that a chemical prevention treatment plan be implemented as soon as possible.

Listed below are the recommendations for chemical treatment:

1. Systemic insecticide treatments using imidacloprid and emamectin benzoate are recommended for prevention and control of EAB on the high valued ash trees in all the surveyed areas listed in Appendix B.
2. Where possible, soil treatments should be preferred over trunk injections as they are less costly and do not cause wounding of trees.

3. The insecticide recommended for soil treatments is Xytect™. Xytect™ is labeled for application at a higher maximum rate than other imidacloprid formulations. Based on research results, trees larger than 15 inch dbh should be treated using the highest labeled rate. Merit® imidacloprid formulations are not labeled for use at the higher rate (13). If Merit® is used when treating larger trees; best results will be obtained with two applications per year.
4. Soil injections are most effective when made at the base of the trunk.
5. Soil injections should be no more than 2-4 inches deep, to avoid placing the insecticide beneath the feeder roots.
6. The insecticide recommended for trunk injection is emamectin benzoate. This is the only product to date that controls EAB for more than one year with a single application.
7. Soil and stem injections are more effective when applied during the spring.
8. To facilitate uptake, trunk and soil insecticides should be applied when the soil is moist but not saturated or excessively dry.

Monitoring: NCTC should continue to annually monitor tree health conditions and survey for signs and symptoms of EAB infestations. In addition to visual surveys, it is also recommended to deploy attractant-baited purple panel trips to survey for low levels infestations of EAB. The MFO will assist NCTC on preparing a monitoring plan for using the traps (e.g. quantity, trap type, trap locations, etc.). The MFO would also like to coordinate with NCTC on searching for *Cerceris fumipennis* nesting sites. *Cerceris fumipennis* is a native wasp that hunts buprestid beetles, including EAB, and brings them back to their nest to feed. Nests can be located and monitored to detect the present of EAB.

Biological Control: NCTC plans to implement a suite of Integrated Pest Management alternatives to mitigate the effects of EAB when it arrives, which includes biological controls as they come available.

Public Awareness: The NCTC is a facility that promotes conservation education for the public and training for the conservation and resource management community. Resource managers from all over the country come to this facility for training throughout the year. NCTC has the unique opportunity to educate the visitors about the threat of EAB and how they are being proactive in preparation for its arrival. The MFO will assist the NCTC by preparing a display that explains their EAB management plan.

REFERENCES

(1) http://Ashalert.osu.edu

(2) Proceeding of the emerald ash borer national research and technology development meeting - Parra G, Lance D, Mastro VC, Reardon R, Benedict D, eds. (2011) Wooser, OH: U.S. Forest Service, Forest Health Technology Enterprise Team.

(3) Martin AC, Zims HS, Nelson AL. 1951. American Wildlife and Plants. A Guide to Wildlife Food Habits. Dover Publications, Inc., New York.

(4) Faanes CA. Wooded islands in a sea of prairie. Am. Birds (1984):3-6.

(5) Gandhi KJK, Cognato AI, Lightle DM, Mosley BJ, Nielsen DG, Herms DA. Species Composition, Seasonal Activity, and Semiochemical Response of Native and Exotic Bark and Ambrosia Beetles (Coleoptera: Curculionidae: Scolytinae) in Northeastern Ohio. Journal of Economic Entomology (2010) 103:1187-1195.

(6) Reiners WA, Reiners NM. Energy and Nutrient Dynamics of Forest Floors in Three Minnesota Forests. Journal of Ecology (1970) 58:497-519.

(7) http://www.emeraldashborer.info

(8) Kovacs KF, Haight RG, McCullough DG, Mercader RJ, Siegert NW, Liebhold AM. Cost of potential emerald ash borer damage in U.S. communities, 2009–2019. Ecological Economics (2010) 69:569-578.

(9) McCullough DG, Katovich SA. Pest Alert: Emerald Ash Borer--Area USFSN, ed. (2004).

(10) Bauer LS, Haack RA, Miller DL, Petrice TR, Liu H. Emerald ash borer life cycle. In: Proceedings of the emerald ash borer research Poland TM, McCullough DG. Emerald Ash Borer: Invasion of the Urban Forest and the Threat to North Americas Ash Resource. Journal of Forestry (2006) 104:118-124.

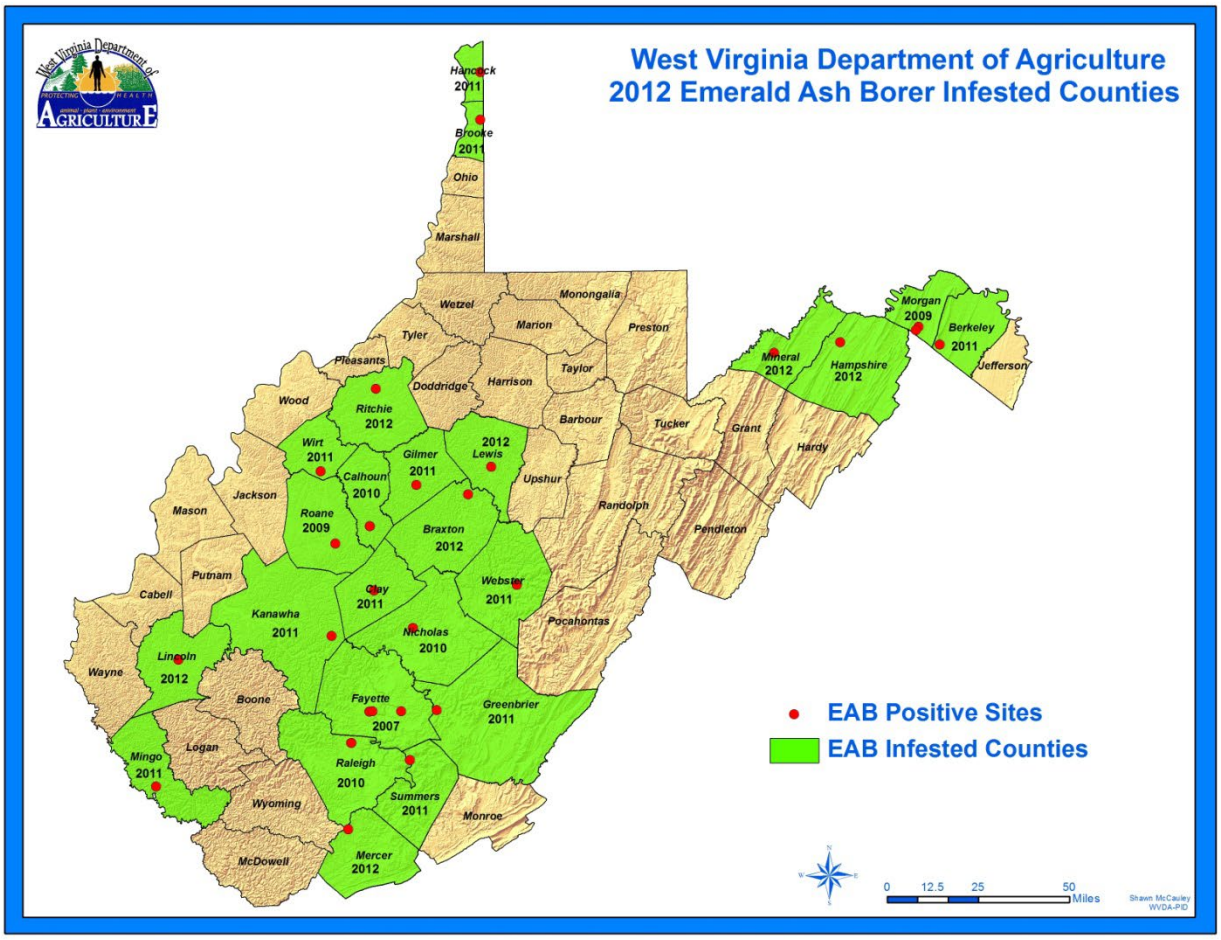
(11) http://www.emeraldashborer.info/westvirginiainfo.cfm

(12) Herms DA, McCullough DG, Smitley DR, Sadof C, Williamson RC, Nixon PL. Insecticide options for protecting ash trees from emerald ash borer. (2009) http://www.emeraldashborer.info/files/Multistate_EAB_Insecticide_Fact_Sheet.pdf

APPENDIX A

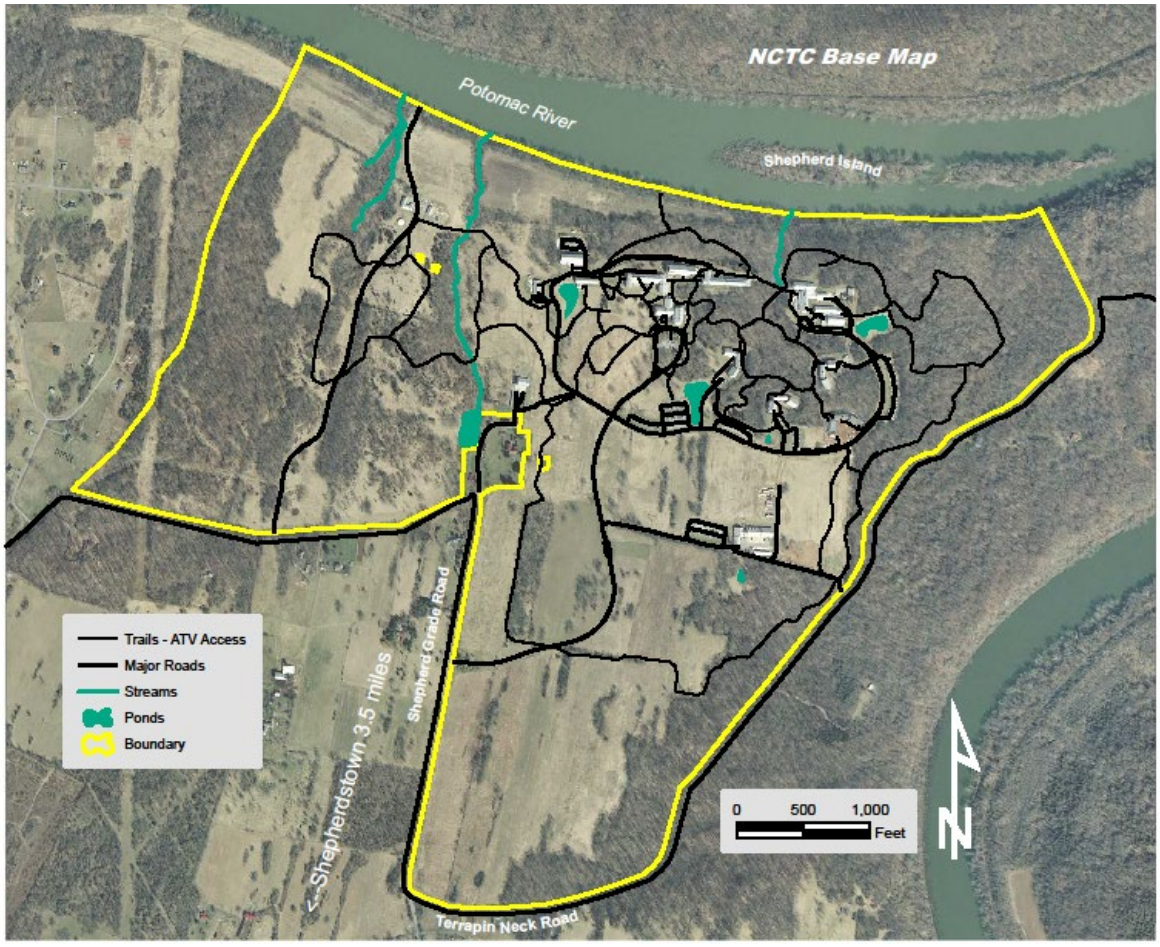
MAPS

A-1


West Virginia Department of Agriculture
2012 Emerald Ash Borer Infested Counties
Hancock 2011
Brooke 2011
Ohio
Marshall
Wetzel
Monongalia
Marion
Preston
Tyler
Pleasants
Taylor
Harrison
Doddridge
Wood
Ritchie 2012
Barbour
Tucker
Grant
Hardy
Wirt 2011
Gilmer 2011
2012 Lewis
Upshur
Calhoun 2010
Jackson
Mason
Roane 2009
Randolph
Pendleton
Braxton 2012
Putnam
Webster 2011
Cabell
Clay 2011
Pocahontas
Kanawha 2011
Nicholas 2010
Lincoln 2012
Wayne
Boone
Fayette 2007
Greenbrier 2011
Logan
Raleigh 2010
Mingo 2011
Summers 2011
Monroe
Wyoming
Mercer 2012
McDowell
Morgan 2009
Berkeley 2011
Jefferson
Mineral 2012
Hampshire 2012
EAB Positive Sites
EAB Infested Counties
0 12.5 25 50 Miles
Shawn McCauley WVDA-PID

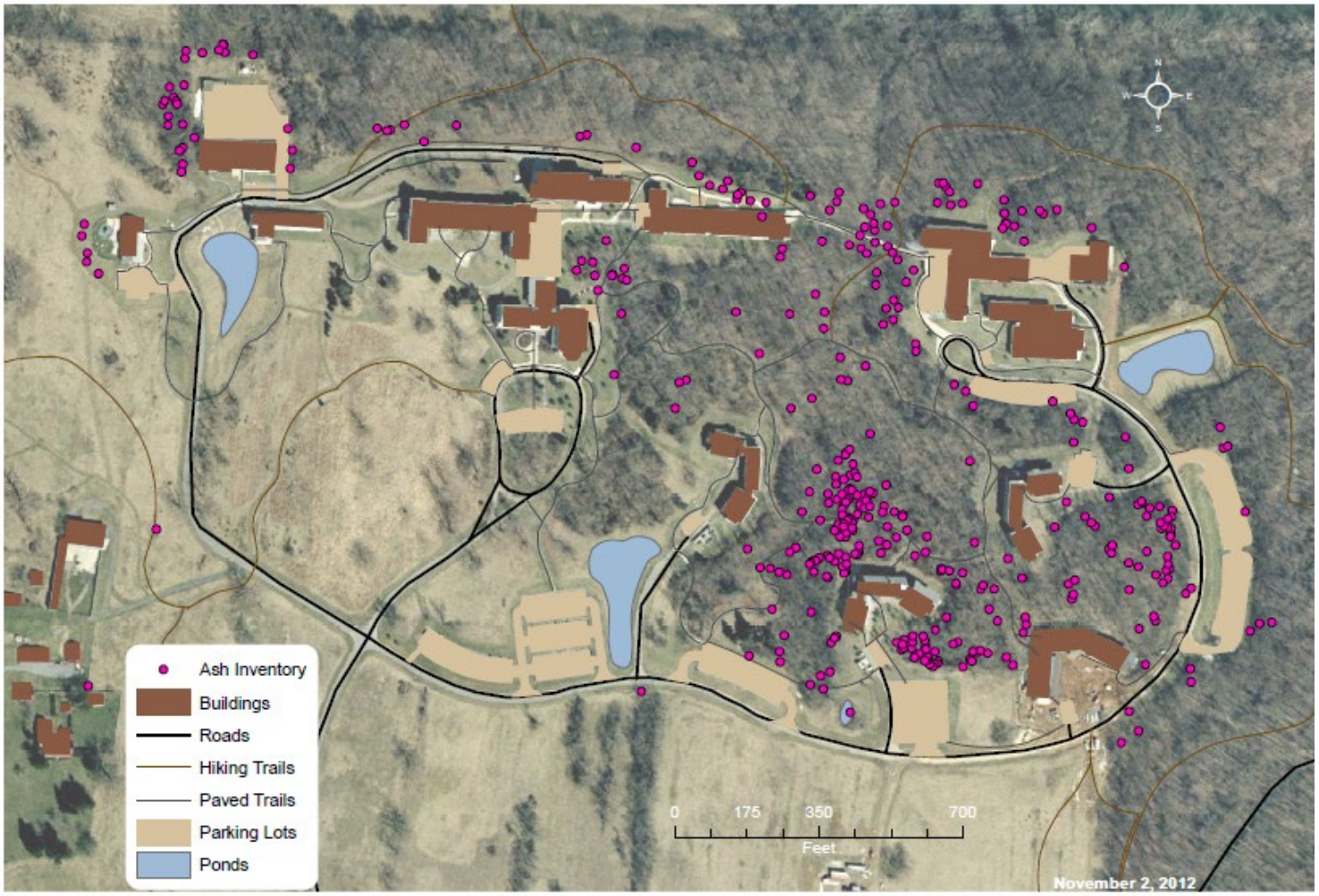
A-2

National Conservation Training Center Property



A-3

US Fish and Wildlife Service - NCTC Ash Inventory 2012



APPENDIX B

SURVEY RESULTS

Ash Inventory at NCTC - 2012

	Criteria for Trees to be Treated:
	Not in poor condition, preferably better than fair condition,
	Plus, a total rating of 6 or higher out of a possible 10.
	Or, at least 16 inches dbh with a target rating of 2,
	Or, at least 21 inches with a target rating of 1.

DBH of Larger Trees
16 - 20 inch
21 - 25 inch
26 inch +

Tree Identifier				Rating				Trees To Treat		
Std #	Tree #	Green Ash?	DBH	Location	Condition	Target	Total	Treat	Tree #	DBH
13b	1		22	4	4	1	9	x	1	22
13b	2		17	3	2	2	7	x	2	17
13b	3		5	3	1	0	4		3	
13b	4		13	4	2	2	8	x	4	13
13b	5		9	3	1	1	5		5	
13b	6		3	3	2	0	5		6	
13a	^		^	^	^	^				
13d	7		27	4	4	2	10	x	7	27
13c	8		4	4	2	2	8	x	8	4
13c	9		7	4	2	2	8	x	9	7
13c	10		3	3	2	1	6	x	10	3
13c	11		4	3	4	0	7	x	11	4
13c	12		20	4	2	2	8	x	12	20
13c	13		9	2	3	0	5		13	
13c	14		13	4	2	2	8	x	14	13

13c	15		10	1	1	0	2		15	
13c	16		4	1	3	0	4		16	
13c	17		23	4	4	2	10	x	17	23
13c	18		10	4	2	2	8	x	18	10
13c	19		7	3	2	0	5		19	
13c	20		13	4	4	2	10	x	20	13
13c	21		15	3	3	2	8	x	21	15
13c	22		10	2	4	1	7	x	22	10
13e	23		17	4	3	2	9	x	23	17
13e	24		33	2	2	0	4		24	
13e	25		20	2	4	0	6	x	25	20
13e	26		18	2	4	0	6	x	26	18
13g	27		26	4	4	2	10	x	27	26
13g	28		3	4	2	1	7	x	28	3
13g	29		6	4	3	1	8	x	29	6
13g	30		6	2	3	0	5		30	
13g	31		7	1	3	0	4		31	
13g	32		4	1	1	0	2		32	
13g	33		17	1	1	0	2		33	
13g	34		3	1	1	0	2		34	
13g	35		3	4	2	1	7	x	35	3
13g	36		10	4	3	2	9	x	36	10
13g	37		13	4	4	2	10	x	37	13
13g	38		6	1	3	0	4		38	
13g	39		4	4	3	1	8	x	39	4
13g	40		3 + 3	3	2	0	5		40	
13g	41		4	2	2	0	4		41	
13g	42		6	4	1	0	5		42	
13g	43		4	4	2	0	6	x	43	4
13g	44		4	1	2	0	3		44	
13g	45		3	1	2	0	3		45	
13g	46		5	1	2	0	3		46	

Std #	Tree #	Green Ash?	DBH	Location	Condition	Target	Total	Treat	Tree #	DBH
13g	47		8	1	3	0	4		47	
13g	48		3	1	2	0	3		48	
13g	49		7	1	2	0	3		49	
13g	50		3	1	2	0	3		50	
13g	51		7	1	3	0	4		51	
13g	52		3	1	2	0	3		52	
13g	53		5	1	2	0	3		53	
13g	54		4	1	2	0	3		54	
13g	55		5	1	2	0	3		55	
13g	56		3	1	2	0	3		56	
13g	57		4	1	2	0	3		57	
13g	58		4	1	2	0	3		58	
13g	59		3	1	2	0	3		59	
13g	60		6	1	3	0	4		60	
13g	61		5	1	3	0	4		61	
13g	62		4	1	1	0	2		62	
13g	63		6	1	1	0	2		63	
13g	64		5	1	1	0	2		64	
13g	65		4	1	1	0	2		65	
13g	66		4	2	3	0	5		66	
13g	67		4	2	2	0	4		67	
13g	68		2 + 4	2	1	0	3		68	
13g	69		4	2	2	0	4		69	
13g	70		4	4	2	0	6	x	70	4
13g	71		9	1	4	0	5		71	
13g	72		3	1	3	0	4		72	
13g	73		9	1	4	0	5		73	
13g	74		3	1	1	0	2		74	
13g	75		5	2	2	0	4		75	
13g	76		3	2	2	0	4		76	
13g	77		6	3	4	1	8	x	77	6
13g	78		3 + 1	4	2	1	7	x	78	3

13g	79		6	1	3	0	4		79	
13g	80		2	1	1	0	2		80	
13h	81		3	2	3	0	5		81	
13h	82		10	4	1	2	7	x	82	10
13h	83		2	2	3	0	5		83	
13h	84		1	2	1	0	3		84	
13h	85		1	2	1	0	3		85	
13h	86		2	2	3	0	5		86	
13h	87		3	3	2	0	5		87	
13h	88		3	4	2	0	6	x	88	3
13h	89		2	3	3	0	6	x	89	2
13c	90		4	4	3	0	7	x	90	4
13c	91		5	4	2	0	6	x	91	5
13c	92		3	4	2	0	6	x	92	3
13h	93		2	3	3	0	6	x	93	2
13h	94		5	2	3	0	5		94	
13h	95		12	2	3	0	5		95	
13h	96		19	2	4	1	7	x	96	19
13h	97		19	4	3	2	9	x	97	19
13i	98		6	3	2	1	6	x	98	6
13i	99		12	4	3	2	9	x	99	12
13i	100		10	4	3	2	9	x	100	10
13i	101		10	3	3	1	7	x	101	10
13i	102		17	3	4	2	9	x	102	17
13i	103		7	2	3	0	5		103	
13i	104		4	2	2	0	4		104	
13i	105		5	3	3	1	7	x	105	5
13i	106		2	3	1	0	4		106	
13i	107		4	3	1	0	4		107	

Std #	Tree #	Green Ash?	DBH	Location	Condition	Target	Total	Treat	Tree #	DBH
13j	108		5	4	4	0	8	x	108	5
13j	109		4	4	4	0	8	x	109	4
13j	110		3	2	2	0	4		110	
13j	111		2	2	3	0	5		111	
13j	112		3	2	2	0	4		112	
13j	113		1	2	3	0	5		113	
13j	114		16	4	3	2	9	x	114	16
13j	115		27	4	2	2	8	x	115	27
13j	116		22	3	4	2	9	x	116	22
13j	117		23	3	4	1	8	x	117	23
13j	118		2	4	2	0	6	x	118	2
13j	119		5	4	4	1	9	x	119	5
13j	120		7	3	3	0	6	x	120	7
13j	121		6	2	1	0	3		121	
13j	122		16	4	4	2	10	x	122	16
13j	123		12	4	4	2	10	x	123	12
13j	124		13	4	3	2	9	x	124	13
13j	125		2	2	1	0	3		125	
13j	126		18	2	2	0	4		126	
13j	127		2	2	3	0	5		127	
13j	128		14	3	4	1	8	x	128	14
13j	129		16	4	3	2	9	x	129	16
13j	130		12	3	4	1	8	x	130	12
13j	131		7	3	2	0	5		131	
13j	132		13	4	2	2	8	x	132	13
13j	133		16	3	3	2	8	x	133	16
13j	134		15	3	3	2	8	x	134	15
13j	135		4	2	4	0	6	x	135	4
13j	136		6	2	3	0	5		136	
13j	137		2	2	1	0	3		137	
13j	138		2	2	3	0	5		138	
13j	139		1	2	1	0	3		139	
13j	140		3	2	1	0	3		140	

13j	141		2	2	1	0	3		141	
13j	142		5	3	4	0	7	x	142	5
13j	143		3	3	2	0	5		143	
13j	144		11	3	2	1	6	x	144	11
13j	145		11	3	2	2	7	x	145	11
13j	146		14	2	2	1	5		146	
13j	147		3	3	4	0	7	x	147	3
13j	148		7	4	4	2	10	x	148	7
13j	149		15	2	2	0	4		149	
13j	150		10	2	1	0	3		150	
13j	151		15	2	1	0	3		151	
13j	152		22	2	4	0	6	x	152	22
13j	153		23	2	3	0	5		153	
13j	154		5	2	3	0	5		154	
13j	155		2	2	2	0	4		155	
13j	156		8	4	4	2	10	x	156	8
13j	157		3	4	4	0	8	x	157	3
13j	158		8	4	4	1	9	x	158	8
13j	159		5	4	3	0	7	x	159	5
13j	160		3	4	4	2	10	x	160	3
13k	161		10	3	4	2	9	x	161	10
13k	162		2	2	2	0	4		162	
13k	163		2	2	2	0	4		163	
13k	164		3	2	3	0	5		164	
13k	165		1	2	3	0	5		165	
13k	166		2	2	2	0	4		166	
13k	167		3	2	3	0	5		167	
13k	168		1 + 1	2	2	0	4		168	
13k	169		12	3	4	0	7	x	169	12
13k	170		5	2	2	0	4		170	
13k	171		4	3	3	0	6	x	171	4
13k	172		2	2	2	0	4		172	
13k	173		8	3	3	0	6	x	173	8

Std #	Tree #	Green Ash?	DBH	Location	Condition	Target	Total	Treat	Tree #	DBH
13k	174		7	4	4	1	9	x	174	7
13k	175		4	4	2	0	6	x	175	4
13k	176		1	4	3	0	7	x	176	1
13k	177		6	4	3	0	7	x	177	6
13k	178		4	4	2	0	6	x	178	4
13k	179		5	4	2	0	6	x	179	5
13k	180		5	4	2	0	6	x	180	5
13k	181		6	4	2	0	6	x	181	6
13k	182		3	4	3	0	7	x	182	3
13k	183		5	3	3	0	6	x	183	5
13k	184		2	3	2	0	5		184	
13k	185		10	4	3	0	7	x	185	10
13k	186		2	3	2	0	5		186	
13k	187		2	3	3	0	6	x	187	2
13k	188		3 + 6	2	3	0	5		188	
13k	189		3	2	3	0	5		189	
13k	190		5 + 2 + 3	2	3	0	5		190	
13k	191		2	4	4	0	8	x	191	2
13k	192		5	4	3	0	7	x	192	5
13k	193		11	4	4	1	9	x	193	11
13k	194		5	4	3	0	7	x	194	5
13k	195		7	4	3	0	7	x	195	7
13k	196		3	3	3	0	6	x	196	3
13k	197		3	3	3	0	6	x	197	3
13k	198		9	2	2	0	4		198	
13k	199		23	4	2	0	6	x	199	23
13k	200		9	3	3	0	6	x	200	9
13k	201		5	4	2	0	6	x	201	5
13k	202		8	4	4	0	8	x	202	8
13k	203		4 + 2	4	3	0	7	x	203	4
13k	204		5	4	3	2	9	x	204	5
13k	205		5	4	3	2	9	x	205	5

13k	206		2	4	1	0	5		206	
13k	207		3	4	2	0	6	x	207	3
13k	208		3	2	3	0	5		208	
13k	209		2	2	2	0	4		209	
13k	210		8	4	4	2	10	x	210	8
13k	211		4	4	3	2	9	x	211	4
13k	212		3	3	3	0	6	x	212	3
13k	213		3	2	3	0	5		213	
13k	214		2	2	3	0	5		214	
13k	215		2	3	3	0	6	x	215	2
13l	216		3	4	2	0	6	x	216	3
13l	217		3	2	4	0	6	x	217	3
13l	218		2	2	4	0	6	x	218	2
13l	219		2	2	3	0	5		219	
13l	220		10	4	4	1	9	x	220	10
13l	221		8	4	4	1	9	x	221	8
13l	222		12 + 19	4	2	1	7	x	222	19
13l	223		10	3	3	2	8	x	223	10
13l	224		7 + 3	4	2	1	7	x	224	7
13l	225		3	4	4	0	8	x	225	3
13l	226		2	2	2	0	4		226	
13l	227		4	4	4	0	8	x	227	4
13l	228		3	4	4	0	8	x	228	3
13l	229		3	4	3	0	7	x	229	3
13l	230		14	3	3	0	6	x	230	14
13l	231		4	2	3	0	5		231	
13l	232		5	2	4	0	6	x	232	5
13l	233		2	2	1	0	3		233	
13l	234		3	2	3	0	5		234	
13l	235		3	2	4	0	6	x	235	3
13l	236		3	1	3	0	4		236	
13l	237		4	1	3	0	4		237	
13l	238		2	1	1	0	2		238	

Std #	Tree #	Green Ash?	DBH	Location	Condition	Target	Total	Treat	Tree #	DBH
13I	239		1	1	2	0	3		239	
13I	240		2	1	3	0	4		240	
13I	241		2	1	3	0	4		241	
13I	242		2	1	1	0	2		242	
13I	243		2	1	3	0	4		243	
13I	244		1	2	3	0	5		244	
13I	245		2	1	3	0	4		245	
13I	246		3	1	3	0	4		246	
13I	247		4	4	3	0	7	x	247	4
13I	248		7	4	3	1	8	x	248	7
13I	249		2	3	3	0	6	x	249	2
13I	250		2	3	3	0	6	x	250	2
13I	251		4	3	4	0	7	x	251	4
13I	252		6	3	4	0	7	x	252	6
13I	253		2	1	3	0	4		253	
13I	254		5	1	4	0	5		254	
13I	255		4	1	4	0	5		255	
13I	256		4	3	4	0	7	x	256	4
13I	257		5	1	3	0	4		257	
13I	258		9	1	4	1	6	x	258	9
13I	259		8	1	3	2	6	x	259	8
13I	260		1	3	3	0	6	x	260	1
13I	261		2	3	2	0	5		261	
13I	262		2	4	1	0	5		262	
13I	263		8	4	4	2	10	x	263	8
13I	264		11	4	4	2	10	x	264	11
13I	265		7	4	3	2	9	x	265	7
13I	266		2	4	2	0	6	x	266	2
13I	267		3	3	2	0	5		267	
13I	268		2	3	2	0	5		268	
13I	269		3	3	3	0	6	x	269	3
13I	270		7	3	3	0	6	x	270	7
13I	271		6	2	3	0	5		271	

13l	272		4	2	4	0	6	x	272	4
13l	273		2	2	2	0	4		273	
13l	274		1	2	2	0	4		274	
13l	275		3	3	4	0	7	x	275	3
13l	276		2	2	3	0	5		276	
13l	277		3	3	3	0	6	x	277	3
13l	278		4	4	3	1	8	x	278	4
13l	279		1	4	3	0	7	x	279	1
13l	280		2	4	3	0	7	x	280	2
13l	281		3	4	3	1	8	x	281	3
13l	282		2	3	2	1	6	x	282	2
13l	283		3	3	2	0	5		283	
13l	284		3	4	4	0	8	x	284	3
13l	285		3	4	3	1	8	x	285	3
13l	286		3	2	3	0	5		286	
13l	287		4	2	4	0	6	x	287	4
13m	288		8	2	4	0	6	x	288	8
R6	289		14	4	3	2	9	x	289	14
Hendrix	290		26	4	3	2	9	x	290	26
Day Care	292	y	3	4	4	2	10	x	292	3
Day Care	293	y	4	4	4	2	10	x	293	4
Day Care	294	y	3	4	4	2	10	x	294	3
Day Care	295	y	3	4	4	2	10	x	295	3
Day Care	296	y	4	4	4	2	10	x	296	4
20	297		15	4	2	1	7	x	297	15
20	298		8	4	2	2	8	x	298	8
20	299		17	4	3	2	9	x	299	17
20	300		22	4	4	2	10	x	300	22
20	301		17	2	1	2	5	x	301	17

Std #	Tree #	Green Ash?	DBH	Location	Condition	Target	Total	Treat	Tree #	DBH
19	302		9	2	1	1	4		302	
19	303		10	4	2	2	8	x	303	10
19	304		16	2	4	1	7	x	304	16
19	305		20	4	4	2	10	x	305	20
19	306		9	4	4	2	10	x	306	9
19	307		9	4	3	1	8	x	307	9
19	308		11	3	2	1	6	x	308	11
16	309		30	4	2	2	8	x	309	30
16	310		18	4	4	2	10	x	310	18
16	311		12	2	4	1	7	x	311	12
16	312		22	2	4	1	7	x	312	22
16	313		17	2	3	1	6	x	313	17
16	314		23	2	4	1	7	x	314	23
16	315		7	3	2	1	6	x	315	7
16	316		12	3	3	1	7	x	316	12
16	317		15	2	3	2	7	x	317	15
16	318		15	3	4	2	9	x	318	15
16	319		8	4	2	1	7	x	319	8
16	320		18	4	4	2	10	x	320	18
16	321		15	4	3	2	9	x	321	15
16	322		8	3	2	1	6	x	322	8
16	323		18	2	4	1	7	x	323	18
16	324		9	2	3	0	5		324	
16	325		7	4	2	1	7	x	325	7
16	326		5	4	4	1	9	x	326	5
16	327		7	3	2	1	6	x	327	7
16	328		15	3	3	2	8	x	328	15
16	329		11	3	2	0	5		329	
16	330		8	4	2	1	7	x	330	8
12	331		10	2	2	1	5		331	

12	332		14	4	4	2	10	x	332	14
12	333		4	4	1	0	5		333	
12	334		6	4	3	1	8	x	334	6
12	335		8	4	4	2	10	x	335	8
12	336		11	4	3	2	9	x	336	11
12	337		13	4	1	2	7	x	337	13
12	338		7	3	1	0	4		338	
12	339		6	4	1	2	7	x	339	6
12	340		17	3	3	2	8	x	340	17
12	341		18	4	3	2	9	x	341	18
12	342		23	3	3	1	7	x	342	23
12	343		2	4	3	0	7	x	343	2
12	344		2	4	1	0	5		344	
12	345		2	4	3	0	7	x	345	2
12	346		2	3	1	0	4		346	
12	347		1	3	2	0	5		347	
12	348		3	4	4	1	9	x	348	3
12	349		2	4	1	1	6	x	349	2
12	350		2	3	1	0	4		350	
12	351		16	4	2	2	8	x	351	16
12	352		11	2	1	0	3		352	
12	353		14	4	4	1	9	x	353	14
12	354		9	2	3	1	6	x	354	9
12	355		7	2	4	1	7	x	355	7
12	356		4	2	3	0	5		356	
12	357		52	3	1	0	4		357	
12	358		20	3	3	2	8	x	358	20
12	359		13	2	3	2	7	x	359	13
12	360		23	2	4	1	7	x	360	23
12	361		6	2	1	1	4		361	
12	362		7	2	2	1	5		362	
11	363		2	4	2	1	7	x	363	2
11	364		4	4	4	2	10	x	364	4

Std #	Tree #	Green Ash?	DBH	Location	Condition	Target	Total	Treat	Tree #	DBH
11	365		2	4	4	2	10	x	365	2
11	366		multi-small	2	1	2	5		366	
11	367		12	2	3	1	6	x	367	12
11	368		6	2	1	0	3		368	
11	369		9	3	2	1	6	x	369	9
11	370		11	2	3	0	5		370	
11	371		15	3	2	1	6	x	371	15
11	372		21	3	4	1	8	x	372	21
11	373		16	3	4	2	9	x	373	16
11	374		13	3	4	1	8	x	374	13
11	375		22	3	4	2	9	x	375	22
11	376		18	3	4	2	9	x	376	18
11	377		9	3	1	1	5		377	
11	378		13	3	4	0	7	x	378	13
11	379		11	3	2	0	5	x	379	11
11	380		24	3	4	2	9	x	380	24
11	381		12	3	1	0	4		381	
11	382		16	3	3	2	8	x	382	16
11	383		9	3	2	2	7	x	383	9
11	384		24	3	3	2	8	x	384	24
11	385		11	3	2	2	7	x	385	11
11	386		10	2	2	1	5		386	
11	387		18	3	2	2	7	x	387	18
11	388		15	3	1	1	5		388	

Total Number of Trees			388				Number of Trees to Treat	235
Total Diameter of Trees			2973"				Percent of Total Trees to Treat	61%
Average Diameter of Trees			7.7"				Total Diameter of Trees to Treat	2200"
							Average Diameter of Trees to Treat	9.4"
							Number of Trees less than 15" dbh	171
							Average Diameter of Trees < 15"	6.4"
							Number of Trees more than 15" dbh	57
							Average Diameter of Trees > 15" dbh	19.4"